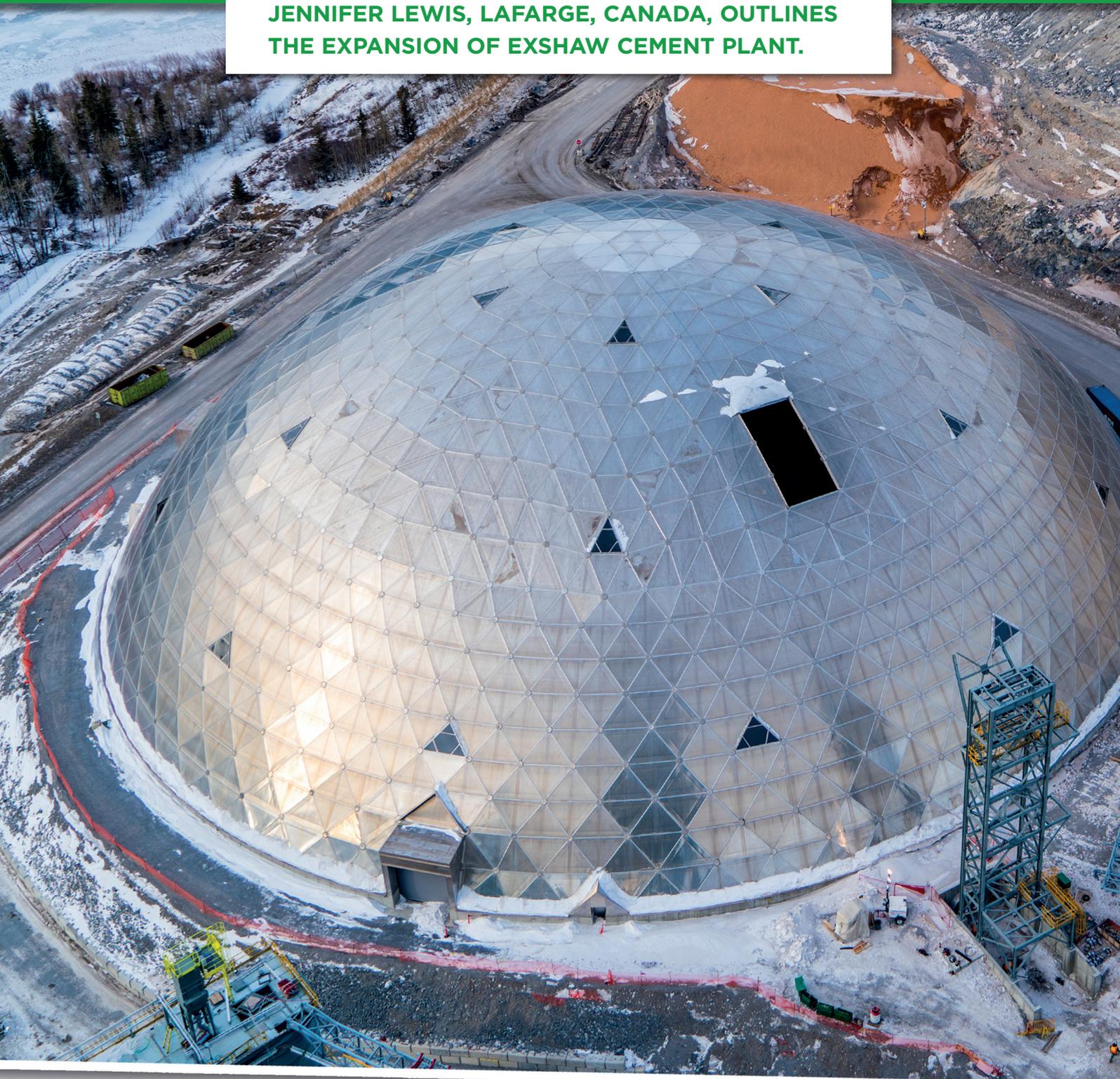




# PLANT TOUR PREVIEW: EXSHAW

**JENNIFER LEWIS, LAFARGE, CANADA, OUTLINES  
THE EXPANSION OF EXSHAW CEMENT PLANT.**





### Introduction

Set in the heart of the Canadian Rockies, and just 18 km from the border of Banff National Park, sits Lafarge Canada's Exshaw Cement Plant, which is a member of LafargeHolcim. Built in 1906, the plant was owned by Western Canada Cement and Coal who planned to be the first to offer cement to the West's flourishing cities and towns. The plant's neighboring community, the hamlet of Exshaw, was literally built to support the plant. In fact, when the plant announced a CAN\$30 million expansion to meet an upward market swing in 1975, properties on Exshaw's main street, Portland Avenue, were moved or demolished to accommodate a new kiln.

One-hundred and ten years later, the plant has a production capability of 1.3 million tpy, and is in the final phase of a massive upgrade and expansion project that will increase its manufacturing capacity by 60%. Through this effort, Lafarge has already met targets to reduce emissions of dust, sulphur dioxide (SO<sub>2</sub>) and oxides of nitrogen (NO<sub>x</sub>) from its existing cement kiln line (Kiln 5), and achieved zero water discharge from its operations. Lafarge is now in its final phase of construction, finishing work on a new kiln line, which is referred to as Kiln 6.

The biggest challenge with the expansion, according to Jim Bachmann, Plant Manager, was space.

"Because we're in a mountain valley, with the community of Exshaw at our fenceline, we have a relatively small site that was inadequate to support parking and laydown for the more than 500 construction employees and materials required to modernise the plant. We secured two satellite locations to support the expansion for material laydown and parking as well as a few local warehouses. We also established a pre-fabrication area in the quarry."

The idea to expand, according to Jim Bachmann, was born in 2006 and a small team of three immediately began working on the plan. The business case to expand was solid.

"We wanted a local, domestic supply for Western Canadian customers," said Bachmann. "With any cement plant, we make investments for 50 years, but the market we serve cycles frequently. It takes commitment and foresight for a company to make this type of long term investment."

In conjunction with meeting increasing demand, there was also a need for a significant retooling to meet increasing sustainability and environmental expectations in this geographic area and LafargeHolcim's own Sustainability Ambitions 2030. Exshaw is in a very environmentally sensitive area – set just outside Banff, which is known as the gem of the Canadian National Park system.

"The communities around our plant are filled with families who cherish nature and are passionate about the environment," says Jim Bachmann. "Finding a balance between lifestyle and industry is important, so what you find in a rural community like this is people who are willing to work together to maintain both interests."



**Figure 1. A look west, at the original Exshaw Plant.**



**Figure 2. In the foreground, the Pfeiffer Vertical Raw Mill, with the KHD five-stage pre-heater, pre-calciner tower behind.**

Lafarge is investing hundreds of millions in this expansion and its neighbors are keen to see it complete. The economic impact of the plant's increased production and GDP of Alberta is estimated at CAN\$800 million per year. Lafarge's investment also provides long term employment opportunities in the Bow Valley, an area where there are few large industrial employment opportunities.

### Expansion benefits

During its modernisation in the 70s and 80s, the company moved from a wet to a dry process. This time around, the goal was to design a modern, efficient and reliable plant using recent but proven technology.

The new Kiln 6 is a long dry technology with a five-stage pre-heater pre-calciner. Per t of production the new kiln is approximately 30% cleaner when it comes to SO<sub>2</sub>, and 75% cleaner for NO<sub>x</sub> emissions. Greenhouse gas

emissions from combustion are also 25% lower because the retired Kiln 4 had higher fuel consumption. As part of the expansion, a number of the emission control systems – while innovative 40 years ago – needed replacing to meet today's environment specs.

"We will also be retiring the gravel bed filter technology," Bachmann adds. "This is a type of dust control treatment that was prevalent in the 70s and 80s. Instead, Kiln 6 will have a state-of-the-art bag-house to collect particulates, hence the high-level of improvement projected."

The project's first major milestone, the upgrade to the existing Kiln 5, was completed in June 2014. The plant invested CAN\$20 million in this upgrade, which introduced additional dust mitigation and noise abatement equipment that reduced emissions on that kiln significantly, with SO<sub>2</sub> reduced by 60% and NO<sub>x</sub> reduced by 40%.

In November 2015, the plant achieved its second major milestone with the official retirement of Kiln 4. As part of its permit to expand the Exshaw Plant, Lafarge committed to shut down Kiln 4 to meet new emissions targets established by the provincial government.

### Construction experiences

Construction of any plant of this size comes with its own set of challenges, yet Lafarge has managed to achieve every construction milestone while remaining injury-free. Despite the best laid contingency plans to address construction issues, such as delays in receiving parts, standard winter weather in Canada, and difficulty attracting trades when needed, nobody anticipated that wind speeds would reach the level they did when construction was at its peak in January 2015.

"We were only able to use the large site crane for three days in that month-long period," said Bachmann.

Another interesting experience during the expansion project was the decision process and implications of changing from plans to reconfigure the existing stacker reclaimer system to building a new system.

Traditionally, the plant's quarry operations require the materials used for cement making to be stored outside. With the high winds near Exshaw, those materials can easily become airborne, contributing to fugitive dust issues. Moving materials inside a dome could help the plant gain production efficiencies and reduce dust.

The team looked at all domes available, weighing the pros and cons of each type. Concrete, steel and aluminum domes were considered. How each one gets erected varies but from a safety perspective, the aluminum dome was the safest to build, so the decision was made.

The dome was purchased independently of the equipment, so the team had to be certain the stacker reclaimer would fit inside the dome. At approximately 110 m in diameter, with a total volume 53 000 t of material – the dome quickly became the most talked about feature of the project.

"We needed 42 concrete pads for tie-down of the dome while under construction. We built it from ground level to reduce work at heights, which meant we had to have cables securing the structure to guard against wind lift," says Bachmann.

An employee came up with the idea of naming the dome, so Lafarge launched a contest that drew over 300 name submissions from the public and significant media coverage across Canada.

"We were absolutely blown away by the number and quality of the entries," says Bachmann. "It was just great to see this level of community involvement with our expansion project." Employees chose the winning name, EcoDome.

### **Unique construction methods**

The Exshaw Plant sits on a combination of drilled concrete piles to bedrock. In fact, as part of the expansion the preheater tower and plant were relocated to take advantage of the underground rock structures that would provide the strongest foundation.

The new raw mill and preheater tower was completed using a lean mix pour sitting on bedrock. Kiln piers and the finish mill are on caissons. The preheater tower is not typical either – the preheater structure consists of steel tubes filled with concrete. Structures such as this are typically steel designs with large H-beams. This composite design provides

a balance of the two technologies to take advantage of the strength characteristics of both in a more optimised and economic design.

The expansion and modernisation overall has been designed to lower fuel and energy consumption. Even the material handling systems have been designed for lower power consumption.

"For example, air slides and bucket elevators were selected to move cement horizontally rather than doing the same thing pneumatically," added Bachmann.

The new plant also has a circular pre-homo pile and a vertical finish mill, which are technologies that typify the most recent cement plant design and construction.

"We have worked closely with the engineering and construction teams since 2013," Bachmann adds. "Significant investment in employee training will allow us to quickly optimise this new equipment. I could not be more proud of this plant team's preparation and commitment."

Now in the final phase of construction, the new line is expected to be completed in mid-2016, all focus remains on safety and achieving the goal of working almost three million man hours lost time injury-free.

"We're really looking forward to hosting delegates from around the world in May 2017," says Bachmann. It will be a good way to celebrate the new kiln's first year of operation. 